

AMENDMENTS TO THE CLAIMS

The following claim listing is to replace all previous claim listings. Amendments to the claims are illustrated through strikethrough (for deleted matter) and underlining (for added matter).

Claim listing:

1. (currently amended): An apparatus for modifying an electrical audio signal for input to a sonic reproduction device that includes a speaker characterized by a plurality of individual responses which in combination define an overall response for the sonic reproduction device which includes, ~~each individual response comprising at least one of a frequency, time, phase or and~~ transient response, said apparatus comprising:

a plurality of modification filters having modification responses that simulate the plurality of individual responses, at least one said modification filter simulating an individual component of the speaker, the modification filters for receiving the electrical audio signal, modifying the electrical audio signal and providing the electrical audio signal to the sonic reproduction device; and

a plurality of adjustable parameters, each associated with at least one of the modification filters for allowing adjustments to the responses of the modification filters;

1 wherein the adjustments create a plurality of individual conjugate
2 responses, each individual conjugate response associated with at least one of the
3 plurality of individual responses.
4

5 2. (original): The apparatus of claim 1 wherein the plurality of individual
6 responses of the sonic reproduction device are related to at least one of
7 mechanical, acoustic and electromagnetic behavior of the sonic reproduction
8 device.
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11 3. (original): The apparatus of claim 1 wherein the filters are defined by
12 digital signal processes.
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14 4. (original): The apparatus of claim 1 wherein the filters are defined by
15 analog circuitry.
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18 5. (original): The apparatus of claim 1 wherein the plurality of
19 modification filters are non-interacting.
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21 6. (original): The apparatus of claim 1 wherein the plurality of
22 modification responses combine to form an overall response that is a conjugate to
23 the overall response for the sonic reproduction device.
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1 7. (original): The apparatus of claim 1 wherein at least one of the
2 modification filters comprises a cut-off filter and the parameters for adjusting the
3 frequency response of the cut-off filter comprise peak frequency, amplitude and Q
4 parameters.

5
6 8. (original): The apparatus of claim 7 wherein the peak frequency,
7 amplitude and Q parameters modify the frequency response of the cut-off filter in
8 at least one of the low and high frequency ranges.

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11 9. (original): The apparatus of claim 1 wherein at least one of the
12 modification filters comprises a constant slope equalizer and the parameters for
13 adjusting the frequency response of the constant slope equalizer comprising
14 crossover frequency and boost shelf parameters.

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16
17 10.(original): The apparatus of claim 9 wherein the crossover frequency
18 and boost shelf parameters modify the frequency response of the constant slope
19 equalizer in at least one of the low and high frequency ranges.

20
21 11.(original): The apparatus of claim 1 wherein at least one of the
22 modification filters comprises a parametric notch filter and the parameters for
23 adjusting the frequency response of the parametric notch filter comprise notch
24 frequency, amplitude and Q parameters.
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2 12.(original): The apparatus of claim 1 wherein at least one of the
3 modification filters comprises a parametric notch-boost filter and the parameters
4 for adjusting the frequency response of the parametric notch-boost filter comprise
5 notch frequency, amplitude and Q parameters.
6

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8 13.(currently amended): A sound compensation system for altering an
9 electrical audio signal for input to a sonic reproduction device including a speaker
10 and an enclosure which have ~~having~~ associated behavioral characteristics, said
11 system comprising:

12 a model of the sonic reproduction device having a plurality of filters that
13 simulate at least one of the behavioral characteristics of the sonic reproduction
14 device, each filter having an associated response that combine to define an overall
15 response for the model, at least one said filter simulating an individual component
16 of the speaker and another said filter simulating the enclosure, each response
17 comprising at least one of a frequency, time, phase or transient response; and
18

19 a controller that modifies the response of each of the plurality of filters to
20 transform the filter into a conjugate filter having a responses that is conjugate to
21 the original response of the filter.
22

23 14.(original): The system of claim 13 wherein the behavior characteristics
24 are defined by individual components of the sonic reproduction device.
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2 15.(original): The system of claim 13 wherein the behavioral characteristics
3 are defined by groups of individual components of the sonic reproduction device.
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5 16.(original): The system of claim 13 wherein the filters are defined by
6 digital signal processes and the controller comprises a computer.
7

8 17.(original): The system of claim 13 wherein the filters are defined by
9 analog circuits and the controller comprises adjustable circuit components.
10

11
12 18.(original): The system of claim 13 wherein the sonic reproduction
13 device comprises a speaker and at least one of the plurality of filters comprises at
14 least one associated adjustable parameter and the value of the parameter is
15 calculated based on physical characteristics of the speaker.
16

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18 19.(previously presented): The system of claim 18 wherein the physical
19 characteristics of the speaker comprises at least one of cone and coil mass, air
20 volume, mechanical compliance, radiating area, damping, moving mass and motor
21 characteristics.
22

23 20.(original): The system of claim 13 wherein the sonic reproduction
24 device comprises a speaker and at least one of the plurality of filters comprises at
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1 least one associated adjustable parameter and the value of the parameter is derived
2 from a standard speaker model.

3
4 21.(original): The system of claim 13 wherein at least one of the plurality
5 of filters has at least one associated adjustable parameter and the value of the
6 parameter is determined experimentally using standard test measurements.

7
8 22.(original): The system of claim 13 wherein the controller is configured
9 such that an adjustment in the setting of at least one other parameter.

10
11 23.(original): The system of claim 22 wherein the sonic reproduction
12 device comprises a speaker and the one parameter that modules the at least one
13 other parameter relates to the magnet structure and voice coil of the speaker.

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15 24.(original): The system of claim 13 wherein the controller monitors the
16 program conditions at the sonic reproduction device and sets at least one of the
17 parameter values based on the program conditions.

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19 25.(original): The system of claim 24 wherein the program conditions
20 comprise at least one of volume control settings, program level and bass content.

1 26.(original): The system of claim 13 wherein one of the filters comprises a
2 weighted compensation notch filter.

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4 27.(original): The system of claim 26 wherein the filter comprises a single-
5 tuned weighted compensation notch.

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7 28.(original): The system of claim 26 wherein the filter comprises a
8 double-tuned weighted compensation notch.

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10 29.(currently amended): A sound system comprising:
11
12 a sonic reproduction device having associated mechanical, acoustic and
13 electromagnetic behavioral characteristics;

14 a source for outputting an electrical audio signal to a model of the sonic
15 reproduction device, the model having a plurality of filters that simulate at least
16 one of the mechanical, acoustic and electromagnetic behavioral characteristics of
17 the sonic reproduction device, at least one said filter simulating an individual
18 component of a speaker of the sonic reproduction device, the plurality of filters
19 providing an overall each filter having an associated response of the sonic
20 reproduction device that includes comprising at least one of a frequency, time,
21 phase or transient response, the model outputting the electrical audio signal to the
22 sonic reproduction device; and
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1 a controller that modifies the responses of the filters to transform the model
2 into a conjugate model having a plurality of filters with responses that comprise
3 conjugates to the original response of the filter.
4

5 30. (original): The system of claim 29 wherein the filters are defined by
6 digital signal processes.
7

8 31.(original): The system of claim 29 wherein the filters are defined by
9 analog circuitry.
10

11 32.(original): The system of claim 29 wherein the plurality of filters are
12 non-interacting.
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14 33.(original): The system of claim 29 wherein at least one of the filters
15 comprises a cut-off filter and modifications to the frequency response of the cut-
16 off filter comprise adjustments to peak frequency, amplitude and Q.
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19 34.(original): The system of claim 29 wherein at least one of the filters
20 comprises a constant slope equalizer and modifications of the frequency response
21 of the constant slop equalizer comprise adjustments to crossover frequency and
22 boost shelf.
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1 35.(original): The system of claim 29 wherein at least one of the filters
2 comprises a parametric notch filter and modifications to the frequency response of
3 the parametric notch filter comprise adjustments to notch frequency, amplitude
4 and Q.

6 36.(original): The system of claim 29 wherein at least one of the filters
7 comprises a parametric notch-boost filter and modifications to the frequency
8 response of the parametric notch-boost filter comprise adjustments to notch
9 frequency, amplitude and Q.

12 37.(currently amended): A method for modifying an electrical audio signal
13 for input to a sonic reproduction device having a speaker and an enclosure which
14 are characterized by a plurality of individual responses which in combination
15 define an overall response for the sonic reproduction device, ~~each individual~~
16 ~~response comprising at least one of a~~ that includes frequency, time, phase ~~or~~ and
17 transient response, said method comprising the steps of:

19 simulating the plurality of individual responses with a plurality of filters,
20 wherein at least one said filter simulates an individual component of the speaker
21 and another said filter simulates the enclosure;

22 adjusting the responses of the plurality of filters such that, for each filter,
23 the adjusted response comprises a response that is a conjugate to one of the
24 individual responses; and
25

inputting the electrical audio signal to the filters.

38.(original): The method of claim 37 wherein the plurality of individual responses of the sonic reproduction device are related to at least one of a mechanical, acoustic and electromagnetic behavior of the sonic reproduction device.

39.(original): The method of claim 37 wherein the plurality of filters are non-interacting.

40.(original): The method of claim 37 wherein the plurality of adjusted responses combine to form an overall response that is a conjugate to the overall response for the sonic reproduction device.

41.(original): The method of claim 37 wherein at least one of the filters comprises a cut-off filter and the step of adjusting the frequency response of the cut-off filter comprises the step of setting at least one of peak, frequency, amplitude and Q.

42.(original): The method of claim 37 wherein at least one of the filters comprises a constant slope equalizer and the step of adjusting the frequency

1 response of the constant slope equalizer comprises the step of setting at least one
2 of crossover frequency and boost shelf.

3
4 43.(original): The method of claim 37 wherein at least one of the filters
5 comprises a parametric notch filter and the step of adjusting the frequency
6 response of the parametric notch filter comprises the step of setting at least one of
7 notch frequency, amplitude and Q.

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10 44.(original): The method of claim 37 wherein at least one of the filters
11 comprises a parametric notch-boost filter and the step of adjusting the frequency
12 response of the parametric notch-boost filter comprises the step of setting at least
13 one of notch frequency, amplitude and Q.

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15 Claims 45-54 (cancelled).

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18 55. (new): A sound compensation system for altering an electrical audio
19 signal for input to a sonic reproduction device having associated behavioral
20 characteristics, said system comprising a model of the sonic reproduction device
21 having a plurality of filters that simulate behavioral characteristics of the sonic
22 reproduction device, wherein:

23 each said filter has an associated response that is combinable to define an
24 overall response for the model; and
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1 at least one said filter, which corresponds to an individual component of the
2 sonic reproduction device, is replaceable with another filter in response to
3 replacement of the individual component of the sonic reproduction device with
4 another individual component, wherein the other filter simulates a behavioral
5 characteristic of the other individual component.
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8 56.(new): The system of claim 55 wherein the individual component
9 corresponds to an individual component of a speaker.
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11 57.(new): The system of claim 55 wherein the behavioral characteristics
12 are defined by groups of individual components of the sonic reproduction device.
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14 58.(new): The system of claim 55 wherein one or more said filters
15 correspond to an enclosure of the sonic reproduction device.
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18 59.(new): The system of claim 55 wherein the sonic reproduction device
19 comprises a speaker and at least one of the plurality of filters comprises at least
20 one associated adjustable parameter and the value of the parameter is calculated
21 based on physical characteristics of the speaker.
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1 60.(new): The system of claim 60 wherein the physical characteristics of
2 the speaker comprises at least one of cone and coil mass, air volume, mechanical
3 compliance, radiating area, damping, moving mass and motor characteristics.
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5 61.(new): The system of claim 55 wherein the sonic reproduction device
6 comprises a speaker and at least one of the plurality of filters comprises at least
7 one associated adjustable parameter and the value of the parameter is derived from
8 a standard speaker model.
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11 62.(new): The system of claim 55 wherein at least one of the plurality of
12 filters has at least one associated adjustable parameter and the value of the
13 parameter is determined experimentally using standard test measurements.
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15 63.(new): The system of claim 55 wherein the sonic reproduction device
16 comprises a speaker and the one parameter that modules the at least one other
17 parameter relates to the magnet structure and voice coil of the speaker.
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